Asset Inventory Workbook

August 24 2018 Template

Overview:

This workbook was developed by the Environmental Finance Center (EFC) at California State University, Sacramento (Sacramento State) for municipalities and rural communities in EPA Region 9 of to facilitate the creation of an asset management plan for stormwater infrastructure. Funded by a USEPA grant.

How to use this Workbook:

The Asset Inventory Worksheet uses color schemes to denote which fields require user input and which are used for calculations, see below for

Required Input	Fields with this color scheme require user input, this will be in the form of manually typing a value or selecting one from a dropdown menu.
Optional Input	Fields with this color scheme will contain a formula that calculates a value, however, this value is an estimate and can be
Calculation	Fields with this color scheme contain formulas that calculate values, these fields should not be edited by the user.
Invalid Value	If a field turns red it means the user has entered a value outside the range of acceptable values, refer to the instructions for

Dropdown Menus - This workbook relies heavily on lookup tables that are stored on the References worksheet. Based on values chosen from

Instructions

Instructions are listed below for completing the "Asset Inventory Worksheet," "Multi Factor COF Worksheet," and the "Prioritization Worksheet".

General Asset Info

Index - The index field provides a unique numerical identifier for each asset. This ensures an asset can be cross-referenced between worksheets

Asset Category - Asset Category is a dropdown field that contains a list of major asset categories. The value chosen from the dropdown menu

Asset Type - This field will have a dropdown list of assets, the assets in the dropdown list depends on the value in the Asset Type field. If the

Material – This field will have a dropdown list of materials based on the value in the Asset Type field. If the material the user wishes to input is

Address or Coordinates – This field is for recording the location of the asset. The user should choose a standard format that will be used for all

Year of Install – This field records the year the asset was originally installed/created. Even if the asset has undergone a major renovation this

Age – This field shows the age of the asset in years. This is calculated as **(Current Year - Year of Install)**.

Effective Life

Estimated Effective Life – This field contains the estimated effective life of the asset in years. The value is auto populated by the workbook using

Adjusted Effective Life – This field will default to the value in the Estimated Effective Life field. Because the Estimated Effective Life field uses

Percent Consumed – A percentage calculated as **(Age / Adjusted Effective Life)**.

Weight (0-10) – This field determines how much weight is given to the Percent Consumed value when calculating the Probability of Failure

Weighted Value – This is calculated as **(Percent Consumed * Weight)**.

Structural Condition

Rating – This field is a user supplied rating (via a drop down menu) of the structural condition. The rating system is 1-5 with 1 being excellent

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 5)**.

Weight (0-10) – This field determines how much weight is given to the structural condition when calculating the POF. Values for the Weight

Weighted Value – This is calculated as **(Score * Weight)**.

Probability of Failure (POF)

POF (0-50) – This field gives the POF for each asset and is calculated as the sum of the two previous weighted values **((Weighted Value[Effective**

Consequence of Failure (COF)

Use Single or Multi Factor COF? - This field is a drop down that allows the user to select whether they will use a single factor for the COF or if

Rating – This field is a user supplied rating of the impact to the public/customers if this asset failed. The rating system is 1-5 with 1 being

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 5)**.

Weight (0-10) – This field is currently a value of 10 as there is only one factor in the COF calculation, if more factors are added this will function

Weighted Value COF (0-50) – This is calculated as **(Score * Weight * 5)**.

Weighted Value from COF Table (0-50) – This field will default to the value in the **Weighted Value COF (0-50)** field. if the user wants a more

Prioritization

Redundancy – This field is a Yes/No input, if the asset in question has redundancy then the answer is yes.

Priority Score (0-100) – This field calculates the final rank for prioritization. Priority Score is calculated as **([Probability of Failure + Consequence**

Notes

Notes – This field is for general note taking for the asset. Any additional information the user thinks will be useful that is not captured in

Once all assets have been added to the Asset Inventory Worksheet and the Priority Score is calculated, the user can switch to the Prioritization

Multi Factor COF Worksheet

The Multi Factor COF Worksheet is for calculating a COF using multiple factors. This calculated COF requires additional information, the fields

Depth of Asset - This field is a dropdown list that contains three choices, Shallower than Average, Average, and Deeper than Average. This is a

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 10)**.

Weight (0-10) – This field determines how much weight is given to the Depth of Asset when calculating the COF. Values for the Weight field

Weighted Value – This is calculated as **(Score * Weight * 5)**.

Size of Asset - This field is a dropdown list that contains three choices, Smaller than Average, Average, and Larger than Average. This is a

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 10)**.

Weight (0-10) – This field determines how much weight is given to the Size of Asset when calculating the COF. Values for the Weight field must

Weighted Value – This is calculated as **(Score * Weight * 5)**.

Proximity to Floodplain - This field is a dropdown list that contains three choices, Not within a floodplain, Within the 500 year floodplain, and

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 2)**.

Weight (0-10) – This field determines how much weight is given to the Proximity to Floodplain when calculating the COF. Values for the Weight

Weighted Value – This is calculated as **(Score * Weight * 5)**.

Proximity to Environmental Hazard - This field is a dropdown list that contains three choices, Not in close proximity to a known hazardous site,

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 2)**.

Weight (0-10) – This field determines how much weight is given to the Proximity to Environmental Hazard when calculating the COF. Values for

Weighted Value – This is calculated as **(Score * Weight * 5)**.

Proximity to Building - This field is a dropdown list that contains three choices, More than 20 feet from a building, Within 20 feet from a

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 2)**.

Weight (0-10) – This field determines how much weight is given to the Proximity to Building when calculating the COF. Values for the Weight

Weighted Value – This is calculated as **(Score * Weight * 5)**.

Proximity to Roadway - This field is a dropdown list that contains five choices, Outside of ROW, Within ROW of minor road, Within ROW of

Score – This is a calculated field that converts the Rating field into a decimal. The formula is **(Rating / 50)**.

Weight (0-10) – This field determines how much weight is given to the Proximity to Roadway when calculating the COF. Values for the Weight

Weighted Value – This is calculated as **(Score * Weight * 5)**.

Total Weight - This field is a check to ensure that all weights add to 10 for each asset. If the total weight is not 10 the cell will turn red, if this

COF (0-50) - This is the calculated COF value, it will automatically be populated into the correct cell in the Asset Inventory Worksheet.

When the user has finished inputting all required information into the Multi Factor COF Worksheet and a COF has been calculated, they can

General Asset Info										Effective Life					Structural Condition				Probability of Failure	Consequence of Failure						Prioritization		Notes
																				Use Single or Multi Factor COF?	Single Factor COF				Multi Factor COF (0-10)			
Index	Asset Category	Asset Type	Material	Length (ft)	Address or Coordinates	From (Address/St)	To (Address/St)	Year of Install	Age (years)	Estimated Effective Life	Adjusted Effective Life	Percent Consumed	Weight (0-10)	Weighted Value	Rating	Score	Weight (0-10)	Weighted Value	POF (0-10)		Rating	Score	Weight (0-10)	Single Factor COF (2-10)		Redundancy	Priority Score (0-100)	Notes
1	Distribution	Gravity Mains	Corrugated Metal					1968	50	65	65	77%	6	4.62	3 - Fair	0.6	4	2.40	7	Multi Factor					10	No	70	
2	Other	Detention Basins						1872	146	50	50	100%	2	2.00	4 - Poor	0.8	8	6.40	8	Single Factor	2 - Low	0.4	10	4		No	34	
3	Green	Green Street						1999	19		30	63%	8	5.07	2 - Good	0.4	2	0.80	6	Single Factor	1 - Negligible	0.2	10	2		No	12	
4	Distribution	Culverts	Corrugated Metal					1950	68	65	70	97%	5	4.86	4 - Poor	0.8	5	4.00	9	Multi Factor					4	No	39	
5	Distribution	Culverts	Corrugated Metal					1986	32	65	1000	3%	10	0.32	1 - Excellent	0.2	0	0.00	0	Multi Factor					1	Yes	0	
6																												
7																												
8																												
9																												
10																												
11																												
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Cell: AA3
Comment: Shinneman, Joel Tyson:
This value is calculated on the Multi Factor COF Worksheet

Multi Factor COF Worksheet

Index	Depth of Asset				Size of Asset			
	Rating	Score	Weight (0-10)	Weighted Value	Rating	Score	Weight (0-10)	Weighted Value
1	10 - Deeper than Average	1	3	3	10 - Larger than Average	1	3	3
2			3				3	
3			3				3	
4	1 - Shallower than Average	0.1	3	0.3	10 - Larger than Average	1	3	3
5	1 - Shallower than Average	0.1	3	0.3	1 - Smaller than Average	0.1	3	0.3
6			3				3	
7			3				3	
8			3				3	
9			3				3	
10			3				3	
11			3				3	
12			3				3	
13			3				3	
14			3				3	
15			3				3	
16			3				3	
17			3				3	
18			3				3	
19			3				3	
20			3				3	
21			3				3	
22			3				3	
23			3				3	
24			3				3	
25			3				3	
26			3				3	
27			3				3	
28			3				3	

Proximity to Floodplain				Proximity to Environmental Ha
Rating	**Score**	**Weight (0-10)**	**Weighted Value**	**Rating**
2 - Within the 100 year floodplain	1	0.5	0.5	2 - Within a site with known environmental hazards
		0.5		
		0.5		
0 - Not within a floodplain	0	0.5	0	1 - Within 100 feet of known hazardous site
0 - Not within a floodplain	0	0.5	0	0 - Not in close proximity to known hazardous site
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
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		0.5		
		0.5		
		0.5		
		0.5		
		0.5		
		0.5		

zard			Proximity to Building			
Score	Weight (0-10)	Weighted Value	Rating	Score	Weight (0-10)	Weighted Value
1	0.5	0.5	2 - Under a building	1	2	2
	0.5				2	
	0.5				2	
0.5	0.5	0.25	0 - More than 20 feet from a building	0	2	0
0	0.5	0	0 - More than 20 feet from a building	0	2	0
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	
	0.5				2	

Proximity to Roadway				Weights	COF
Rating	Score	Weight (0-10)	Weighted Value	Total Weight (10)	COF (0-10)
50 - Under pavement of major road	1	1	1	10	10
		1		10	
		1		10	
40 -Under pavement of minor road	0.8	1	0.8	10	4.35
0 - Outside of ROW	0	1	0	10	0.6
		1		10	
		1		10	
		1		10	
		1		10	
		1		10	
		1		10	
		1		10	
		1		10	
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		1		10	
		1		10	
		1		10	
		1		10	
		1		10	

Asset Category	Asset Type	Material	Address or Coordinates	Year of Install
Distribution	Culverts	Corrugated Metal		1986
Green	Green Street			1999
Other	Detention Basins			1872
Distribution	Culverts	Corrugated Metal		1950
Distribution	Gravity Mains	Corrugated Metal		1968

Age (years)	POF (0-10)	COF (0-10)	Redundancy	Notes	Priority Score (0-100)
32	0	1	Yes		0
19	6		No		12
146	8		No		34
68	9	4	No		39
50	7	10	No		70
					0
					0
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					0
					0
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					0

Asset Category	Type							
Distribution	Gravity Mains	Laterals	Open Channels	Ditches	Culverts	Pressurized Main	Siphons	
Other	Outfalls	Manholes	Detention Basins	Pump	Catch Basins			
Green	Bed Filter	Detention Basir	Dry Basin	Infiltration Basin	Media Filter	Treatment Vault	Wet Basin	Biostrip
	Biofiltration	Bioretention	Bioswale	Infiltration Featur	Porous Pavemen	Settling Basin	Green Street	

Material	Concrete	Brick	Vitrified Clay Pipe	Ductile Iron	HDPE	PVC	Corrugated Meta	Truss Pipe

Ratings	
1 - Excellent	
2 - Good	
3 - Fair	
4 - Poor	
5 - Failure Imminent	

Ratings
1 - Negligible
2 - Low
3 - Moderate
4 - High
5 - Severe

References

EPA, Office of Water (4606M). 2003. Asset Management: A Handbook for Small Water Systems. EPA 816-R-03-016. https://www.epa.gov/dwcapacity/asset-management-resources-small-drinking-water-systems-0
City of Grand Rapids, MI Environmental Protection Services Department. 2016. Stormwater Asset Management and Capital Improvement Plan.

Estimated Effective Life Reference

Asset	EEL (Years)
Gravity Mains /Culverts (Concrete, Brick, Vitrified Clay, Ductile Ir	100
Gravity Mains (HDPE, PVC, Truss Pipe)	75
Gravity Mains / Laterals /Culverts (Corrugated Metal)	65
Laterals (Concrete, Brick, Vitrified Clay, Ductile Iron)	50
Laterals (HDPE, PVC, Truss Pipe)	50
Pressurized Mains	75
Manholes (Brick and Concrete)	100
Catch Basins (Brick and Concrete)	50
Outfalls	75
Detention Basins - Open	50
Infiltration Basins	100
Pump Station – Pumps	20
Pump Stations – Electrical	50
Pump Stations – Mechanical	50
Pump Stations – Structural	50

From the Grand Rapids Stormwater Asset Management Plan

Estimated Effective Life Lookup Table

Asset	EEL (Years)	
Catch Basins	50	
Culverts Concrete	100	
Culverts Corrugated Metal	65	
Detention Basins	50	
Gravity Mains Brick	100	
Gravity Mains Concrete	100	
Gravity Mains Corrugated Meta	65	
Gravity Mains Ductile Iron	100	
Gravity Mains HDPE	75	
Gravity Mains PVC	75	
Gravity Mains Truss Pipe	75	
Gravity Mains Vitrified Clay	100	
Gravity Mains ACP	70	*
Infiltration Basins	100	
Laterals Brick	50	
Laterals Concrete	50	
Laterals Corrugated Metal	65	
Laterals Ductile Iron	50	
Laterals HDPE	50	
Laterals PVC	50	
Laterals Truss Pipe	50	
Laterals Vitrified Clay	50	
Laterals ACP	70	*
Manholes	100	
Ditches	10	
Ditches PVC	25	
Ditches Concrete	50	
Outfalls	75	
Pressurized Mains	75	
Pump	20	

* Reference: Chrysotile Institute

Optional Consequence of Failure Table

COF Factors	Value	Rating Description	Rating	Score	Weight	Weighted Value
Depth of Asset	**1**	1 - Shallower than Average	10	1	3	15
	3	3 - Average				
	10	10 - Deeper than Average				
Size of Asset	**1**	1 - Smaller than Average	10	1	3	15
	3	3 - Average				
	10	10 - Larger than Average				
Proximity to Floodplain	**0**	0 - Not within a floodplain	2	1	0.5	2.5
	1	1 - Within the 500 year floodplain				
	2	2 - Within the 100 year floodplain				
Proximity to Environmental Hazard	**0**	0 - Not in close proximity to known hazardous site	2	1	0.5	2.5
	1	1 - Within 100 feet of a known hazardous site				
	2	2 - Within a site with known environmental hazard				
Proximity to Building	**0**	0 - More than 20 feet from a building	2	1	2	10
	1	1 - Within 20 feet of a building				
	2	2 - Under a building				
Proximity to Roadway	**0**	0 - Outside of ROW	50	1	1	5
	10	10 - Within ROW of minor road				
	15	15 - Within ROW of major road				
	40	40 -Under pavement of minor road				
	50	50 - Under pavement of major road				
Totals					10	50

Copy this value to the "Weighted Value from COF Table" Field ^^^^^^^^^^^^

COF Factors	Weights				Value	Rating Description	
	Gravity	Laterals	Force Mains	Siphons			
Depth of Pipe	3	0	3	3	1	depth <= 8 feet	
					3	8 < depth <= 15 feet	
					10	depth > 15 feet	
Pipe Size	3	4	3	3	2	size <= 12 inches	
					10	12 < size <= 24 inches	
					25	24 < size <= 42 inches	
					35	42 < size <= 72 inches	
					50	size > 72 inches	
Proximity to Floodplain	0.5	1	0.5	0.5	0	Not within a floodplain	
					1	Within the 100 year floodplain	Shouldn’t these be switched?
					2	Within the 500 year floodplain	
Proximity to Environmental Hazard	0.5	1	0.5	0.5	0	Not in close proximity to known hazardous site	
					1	Within 100 feet of known hazardous site	
					2	within a site with known environmental hazards	
Proximity to Buildings	2	3	2	2	0	More than 20 feet from a building	
					1	Within 20 feet of a building	
					2	Under a building	
Proximity to Roadway	1	1	1	1	0	Pipe is outside of ROW	
					10	Pipe is within ROW of minor road	
					15	Pipe is within ROW of major road	
					40	Pipe is under pavement of minor road	
					50	Pipe is under pavement of major road	
Total	10	10	10	10			

Culverts

COF Factors	Weight	Value	Rating Description	
Depth of Pipe	3	1	depth <= 8 feet	
		3	8 < depth <= 15 feet	
		10	depth > 15 feet	
Pipe Size	3	2	size <= 12 inches	
		10	12 < size <= 24 inches	
		25	24 < size <= 42 inches	
		35	42 < size <= 72 inches	
		50	size > 72 inches	
Proximity to Floodplain	0.5	0	Not within a floodplain	
		1	Within the 100 year floodplain	Shouldn’t these be switche
		2	Within the 500 year floodplain	
Proximity to Environmental Hazard	0.5	0	Not in close proximity to known hazardous site	
		1	Within 100 feet of known hazardous site	
		2	within a site with known environmental hazards	
Stream Type	1	1	Ditch	
		3	Stream	
Type of Crossing	2	0	Crosses minor road	
		1	Crosses major road or railroad	
Total	10			

COF Factors	Weights			Value	Rating Description	
	Outfalls	Manholes	Catch Basins			
Depth of Structure	0	2.5	0	1	depth <= 8 feet	
				3	8 < depth <= 15 feet	
				10	depth > 15 feet	
Structure Diameter	8	2.5	4	2	size <= 12 inches	
				10	12 < size <= 24 inches	
				25	24 < size <= 42 inches	
				35	42 < size <= 72 inches	
				50	size > 72 inches	
Proximity to Floodplain	1	0.5	1	0	Not within a floodplain	
				1	Within the 100 year floodplain	Shouldn’t these be switched?
				2	Within the 500 year floodplain	
Proximity to Environmental Hazard	1	0.5	1	0	Not in close proximity to known hazardous site	
				1	Within 100 feet of known hazardous site	
				2	within a site with known environmental hazards	
Proximity to Buildings	0	2	3	0	More than 20 feet from a building	
				1	Within 20 feet of a building	
				2	Under a building	
Proximity to Roadway	0	1	1	0	Pipe is outside of ROW	
				10	Pipe is within ROW of minor road	
				15	Pipe is within ROW of major road	
				40	Pipe is under pavement of minor road	
				50	Pipe is under pavement of major road	
Complex Structure	0	1	NA	0	Structure has appurtenances inside	
				1	No appurtenances inside the structure	
Total	10	10	10			